eMARINA
The quarterly newsletter of
The Hong Kong Joint Branch of The Royal Institution of Naval Architects
and The Institute of Marine Engineering, Science and Technology,
and The Hong Kong Institute of Marine Technology
皇家造船師學會暨輪機工程及海事科技學會香港聯合分會
及香港海事科技學會季刊
Vol. 1 March 2021

HKJB & HKIMT Activities

On-line meeting with IMarEST Chief Executive, Mr. Gwynne Lewis

HKJB Chairman Mr Simon Chen together with eight other committee members, attended an on-line meeting with IMarEST Headquarters and IMarEST Asia Pacific in Singapore on 23 February 2021. The meeting was presided by the IMarEST Chief Executive, Mr Gwynne Lewis who had succeeded Mr. David Loosley on 29 June 2020. Ideas were collected and plans were discussed for the future of developments of the overseas branches for the years to come.

At the beginning of the meeting, Mr Lewis introduced himself briefly about his background in marine consultancy. He worked with Lloyd's Register, IBM, BMT and Orolia as a surveyor, manager and director before becoming a consultant prior to joining IMarEST in 2020. Mr Lewis's relationship with HKJB dates back twenty-six years. He had participated in a Technical Seminar organized by HKJB in 1995

Mr Andrew Wong, the IMarEST Asia Pacific Regional Manager introduced the recent development of IMarEST in the region. Its work includes the accreditation of academic qualifications for professionals in the region, programmes for the industrial professional development and also the recognition and award of various CPD training, workshop and events for the IMarEST (The Institute of Marine Engineering, Science and Technology) and NI (Nautical Institute) Centre of Excellence. The initiatives taken in the past two years and the plan for the forthcoming year were also presented in the meeting. Ms Margaret Marchetti, the institute's Assistant Secretary supplement the details of the supports that can be obtained from the IMarEST HQ and Asia Pacific. It was impressive to see the current developments and the collaborative efforts taken in various locations in mainland China, e.g. Ningbo, Dalian, Harbin and Jiangsu and Zhejiang in promoting the work of the IMarEST.

Mr Simon Chen introduced the HKJB Office Bearers and Committee to Mr. Lewis. The plan and strategy for membership growth and the various initiatives in the five major areas on: education and student affairs; publicity and publication; public social relation; technical meeting and industrial visit; liaison with counter parties and related professional bodies for 2021 were explained. The turmoil and pandemic in 2020 are under control, Hong Kong is expected to return to normal in 2021. Social activities and travelling can be resume around mid-2021. The Hong Kong Joint Branch of RINA & IMarEST and the Hong Kong Institute of Marine Technology who host the Annual Ball have decided to resume the event this year. Mr. Chen took the opportunity to invite Mr. Lewis to attend the forthcoming Annul Ball at the end of 2021.

The opportunities on the development in Hong Kong were also discussed. HKJB Vice Chairman Mr Kaushik Roy proposed offering incentives for shipping companies and related organizations to recruit members and issuing Branch Certificates or other recognition for those members with outstanding contribution to the institute. Mr Stanley Lui (Past Chairman of HKJB) introduced the education system, university programme and vocational training related to marine engineering in Hong Kong, and the possible training support that IMarEST may assist in attracting more youngsters to join the maritime studies, cadetship and professional registration

system. Mr K F Tang (Honorary Treasurer) also shared his views on the possible IMarEST membership development for the three groups: local Hong Kong graduates, superintendents and related professional from India and the maritime professionals from the mainland China.

The meeting ended leaving the participants with many fruitful thoughts for the planning and arrangement of activities for the HKJB in 2021.

The HKJB would like to take the opportunity to thank Capt. Wang Wei Qi, General Manager of the China Energy Ship Management Co Ltd for hosting this important network meeting with IMarEST Headquarter and providing the meeting facilities for the purpose.

(Reported by Leslie Lee)

1st HKJB Webinar - COVID-19 Pandemic (Impact on Shipping)

Due to the COVID-19 pandemic, nearly all the Hong Kong Joint Branch (HKJB) activities were either suspended or cancelled in 2020. A new way is needed to resume the role of the HKJB and its activities under the pandemic in 2021!

With the kind support of Ms Chez McKinney and Ms Anastasia Finch from the IMarEST Events Team, the HKJB was able to organize its first ever Webinar through the IMarEST Webinar platform. This 1st HKJB Webinar was presented by Mr. Kaushik Roy, LLM CMMar CMarTech FIMarEST, Vice Chairman of the Hong Kong Join Branch. Kaushik is an expert on LNG safety, operation, joint venture stat-up & management. He is a 'Harvard' educated negotiator & mediator, expert witness on tankers & gas carriers and he has obtained a Master (LLM) Degree in International Trade Laws from the UK.

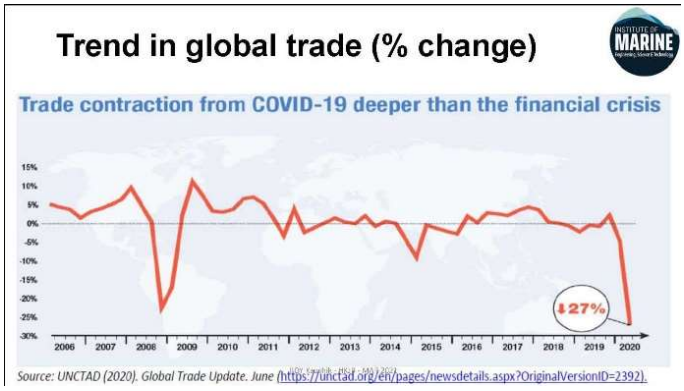
In this Webinar, Kaushik shared his insight on the impact of COVID-19 on the following three aspects: (i) Shipping; (ii) Supply Chain; (iii) Logistics. Kaushik's presentation was interleaved by interactive polls to collect the views of the participants from various sectors in the maritime industry as a real time measurement on what was really happening in the real world. This feedback would echo or reflect the accuracy of Kaushik's vision on the subject.

ASSOCIATED CONSULTANTS & SURVEYORS LTD.
2/F., Man King Building,
38-40, Man Wui Street,
Ferry Point, Kowloon,
Hong Kong.
TEL: 2388 0610 FAX: 2710 9502

Consulting Engineer, Marine Cargo Surveyor, Authorized Boiler Inspector, Inspector of Petroleum & Lifting Appliance Examiner.

Shipping

One of the greatest impacts of COVID-19 is on the global trade. Immediately after the pandemic started, global trade dropped drastically by nearly 27% in a short period of time. Shipping was affected by the pandemic! A poll initiated by Kaushik on how the pandemic affected people indicated that it has changed the way we live and work! It shed some light on the effects of lockdowns and closures of border on the lives of people. People stopped going out dining and shopping. It came as no surprise that the change in those regions that could control the spreading of the pandemic was least affected.



China, Japan, South Korea and ASEAN countries are the major manufacturing centres in the world. Despite a drop in charter rate, the trade in these regions did not show a sharp decline in their global trade.

Another poll on the importance of shipping by Kaushik indicated that almost everybody agreed that shipping is the backbone of global trade. Kaushik did not go deeper into the effects of the possible shift in global trade and economy due to the pandemic but concentrate his efforts in explaining the impact of the pandemic on shipping.

It was found that shipowners had to pay higher insurance premium during the pandemic. The trainings necessary to equip a seafarer to work on ships was difficult to arrange ashore. As more ports were closed or imposed more restrictions to enter, supplies and repair facilities were difficult to secure. Crew changes became more difficult and time consuming because of the 14 to 21 days quarantine period and health screening requirements imposed by landing ports and discharging ports. Shipowners could only use ports where crew changes were still permitted. In most cases, shipowners had to ask seafarers to work longer contracts and crew changes could only be arranged at the closest ports that were still open to these operations. Shore leaves were almost nil under the pandemic. Medical help ashore was also difficult to secure. Seafarers' and their families were worried about each other's health and wellbeing. These were stress raisers that could induce negative effects on staff relationship on board ships.

The pandemic had other effects on shipping too. Building projects on shipyards were delayed. Cargo loading and discharging were either delayed or diverted. Force majeure could be triggered in demurrage and interruptions of cargo shipment. Shipping on the whole became unpredictable. These were nightmares to ship managers!

Kaushik had highlighted some short-term changes to the shipping industry. There would be a drop in maritime trade initially. Blank sailing would occur to circumvent ports with low trade volume. There would be increased in cargo waiting time and delay in crew change. Custom clearance would take longer to complete. Demand and supply mismatch would drive up freight rate. In the long-term, management costs would increase which might lead to merger and acquisition among shipping companies. Supply chain in the maritime industry might have to be adjusted and re-designed to cope with the trading pattern. More intelligent programmes and higher computing power were needed to be developed in finding optimal solutions quickly in the shipment of cargo. He estimated that the utilization rate of VLCC will drop from 99% to about 89% in these two years.

Kaushik's third poll on the immediate changes to shipping was answered with mixed feelings. About one third of the respondents felt that more inspections, surveys and audits will have to be carried remotely. Others like the introduction of more automation on board, work from home culture and reduction of travel of office staff were also supported but to a lesser degree. That was a clear indication that all four choices in the poll might be occurring at present!

After COVID-19, the author postulated that protectionist ideas on trade may proliferate. Pirates attacks will increase. Qualified seafarers will be more difficult to find. The climate change will be brought back on the forefront of the global agenda. It is also envisaged that the operational costs of shipowners will increase and companies may run into deficit. The future of shipping is bleak, investors is likely to reduce their investments in shipping.

Supply Chain

In the long term, the global supply chain may need to be restructured after the pandemic. The supply chain will undergo intermittent disruptions. Shipping companies should strengthen their management of the global supply chain. The reliance on contactless and digital services will increase. Shipping companies within a region may consider co-operating in the transportation of cargo to reduce the time of cargo shipment and to avoid rescheduling their lines too often.

Tourism around the world is almost dead! Hotels and restaurants were hard hit by the pandemic. The demand for higher end poultry, dairy and agricultural products will be reduced drastically. People tend to stock up after the pandemic to stay ready for further outbreaks. There may be food shortages if shipments cannot cope with the demands. As global trade declines, fewer ships will be able to meet the cargo demand. Fuel consumption will be reduced accordingly which in turn drive the oil price down.

The disruption of the supply chain may be caused by many factors that occur in any of the sectors on supply, distribution and demand in the chain. On the supply sector, restrictions on world trade may cause raw material and parts shortage when they cannot be delivered on time to the manufacturers for production. Industrial work force may be a problem too. Workers catching the virus will be placed on quarantine over a period of time before they can resume duties. On the distribution side, quarantine procedures may be imposed in ports on the people responsible for the loading and discharging of cargo thereby causing delays. In extreme cases, a port may be closed completely. Cargoes destine for these ports have to be diverted to other ports for loading and discharging. Causing further delays in their distribution. Again, workers catching the virus will have to be

quarantined before they can resume duties. This may cause a shortage of workforce in the short term. On the demand sector, hoarding may occur when retailors stock up the most needed goods to drive up their profits. Lockdowns and social distancing affect the behaviour of people. Changing of behaviour will prompt shift in demand. People staying home will have lesser desires for luxurious goods such as electrical appliances, extravagant clothes, travelling necessities etc. The demand of these items will diminish during these periods. As home cocking becomes a norm, the demands on pre-cocked products will drop and they will be replaced by raw cooking materials.

Logistics

Logistics is often referred to the transfer of goods between suppliers and retailors. The pandemic has changed this business model. The closure of shops and the reluctance to go out shopping and dining to avoid mixing with people has motivated the consumers to purchase on line and the loss of jobs to some people has affected their desire to buy more other than the necessities. Most people will tend to cock their own meals at home. For those who are more well off, the ordering on line for fast food services is common under the circumstances. This phenomenon may cause the spoilage of fresh food in the market driving up their price. Logistics services will proliferate due to the demand. More order will cause delay in the collection and delivery of goods.

Kaushik closed his presentation with his last poll by asking what is the lesson learnt from the pandemic. Over half of the participants responded that self-caring and caring others is important. Kaushik concluded that the end of the COVID-19 pandemic is nowhere in sight. Although vaccination programs have started in many countries, there is still a long way before herd immunity can be achieved. When the global trade will recover is still uncertain. The effect of the pandemic on slowing down the global trade will continue for some time. Company closures and job losses are inevitable. People ashore and on ships will be stressed by the difficulties facing them all the time. The maritime industries will take proactive actions to alleviate the situation. More investments will go the automation, digitalization and risk assessment of the trading processes. More regional cooperation will take place to reduce the effects of delays in turnaround time in ports and cargo. It appears that the trade in those regions less affected by the pandemic continues to grow at a steady pace while others who do not suffer more!

The efforts of Kaushik in bring up such a good subject for discussion in HKJB was very much appreciated! The presentation certainly prompted us in the trade to think and work harder to solve the problems in hand. Do not underestimate the tenacity of people, the human race has always survived the toughest time in history. So, will we!

(Reported by Leslie Lee)

APEL
ASSOCIATED PROFESSIONAL ENGINEERS LTD
聯 合 專 業 工 程 有 限 公 司
Authorized Marine Surveying Services
Boilers & Pressure Vessels, Lifts & Crane Inspection Services
Accident Investigation, Engineering & Safety Consultancy Services
An ISO Certified Company
920 New Tech Plaza, Tai Yau Street, San Po Kong, Kowloon, Hong Kong.
Tel: (852) 2997-6828 Fax: (852) 2997-6838 E-Mail : apel@apel.com.hk

Members' Corner

Working with Carbon Fiber - Shipbuilding Industry

Introduction

An unconventional yacht was built by a shipyard in Hong Kong. The vessel has a wooden hull. Instead of building the superstructure from metal, it was built from carbon fiber to reduce weight and increase the strength of superstructure as if it was made from steel. The yacht has an overall length of 43 meter which is by far the world's longest wooden vessel built in modern times! I was appointed by my company as a consultant to supervise the construction of the carbon fiber superstructure. And I would like to share my experience in the fabrication techniques in the construction of such a superstructure in this article!

Carbon fiber material is not made from pure carbon fiber. For marine applications, it contains 60 - 70% of carbon by weight and the remaining are bonding resins. It is known to have many desirable properties as a construction material. Its higher tensile strength (> 3.0GPa), greater stiffness, lower weight and volume ratio than metal, higher chemical resistance, higher temperature tolerance and lower thermal expansion properties have made it a popular material for use in the manufacturing products for the aerospace, civil engineering, military, motorsports and shipbuilding industries. Carbon fiber also has a strength to weight ratio much higher than steel. Apparently, carbon fiber is most suitable for use in the construction of strong and light weight structures.

There are currently two common processes used in the fabrication of shipboard structures using composite fibers – hand lay-up and vacuum infusion processes. The quest to decide which process would be more suitable for the construction of carbon fiber needs to be answered before their construction. As a starting point, the construction, strength and weaknesses of each of these processes have to understood thoroughly before making a decision.

Hand Lay-up process

The hand lay-up process, is also known as the wet lay-up process. This is a traditional process used in the shipbuilding industry. A layer of gelcoat is applied first on the mould which serves as a media to prevent the resin from sticking on its surface. After the gelcoat has dried, successive plies of fiber and resin are alternatively laid and applied by hand. Internal core such as ribs, inserts and any other components may also be added between the layering process to strengthen the structure.

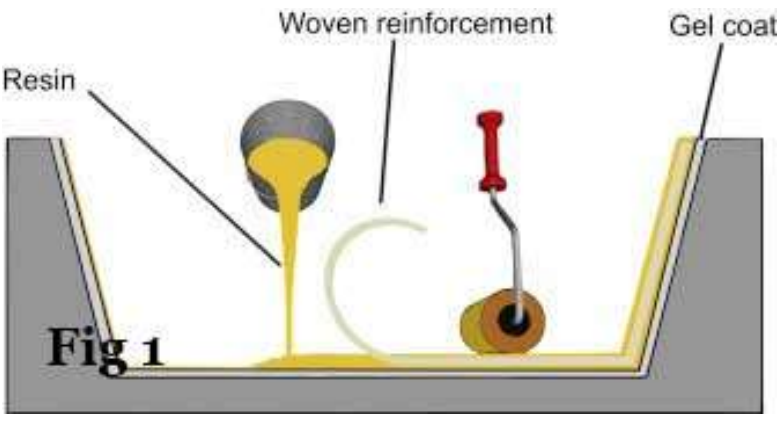


Fig 1

Rollers are used in this process to embed the fiber in the resin and to reduce air bubbles between layers of fiber. (Fig 1) This layering process is repeated until the desired thickness and/or strength is reached. No heat is required during the curing process. The resin will cure at room temperature.

Vacuum Infusion Process

The vacuum infusion process is more complicated which infused resin into the fabrics on a mould to form a structure. A complete set-up is shown Fig. 2.

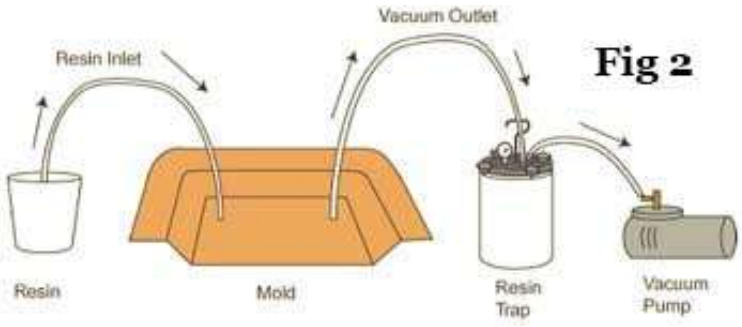


Fig 2

The process involves a number of steps. First, the mould is sprayed with gelcoat. The gelcoat is used to seal up the tooling surface which also serves as a protection layer to the structure during the vacuum process. After the gelcoat has dried, fiber fabrics are laid on the surface of the mould. Internal core such as ribs, inserts and any other components may also be added at this stage. In general, PVC foam, plywood, aluminum or stainless-steel plate may be used as the core material depending on the needs. The addition is only necessary for the sandwich construction.

The complication of this process lies in the requirements to attend to the minute details before the application of resin to ensure an even and smooth flow of resin throughout the structure. It is essential that the placement of resin distribution net and pipes has to be carefully planned before hand to ensure the full penetration of the resin into the cavities of the fiber in the shortest time. It is also of paramount importance that the inner and outer fibers are laid according to the specification. Release sheet is then placed on top. This is to ensure the removal of parts after the product cures. A bagging sheet is finally placed along the edge of mould for the purpose of creating a vacuum so that resin can suck into the fibers through the tubes under atmospheric pressure.

Before the infusion process takes place, the vacuum pump is to be activated first. The whole fabricated structure is then checked for major leaks. Leaks found after starting the infusion process is not difficult to detect and repair. Air bubbles can be seen in the resin as it passes a leaking point. However, if these remedial actions cannot be completed quickly, air bubbles may be trapped in these leaking areas causing weak spots in the structure. If many of these week spots occurred in the structure, the whole structure has to be rebuilt! Today, a stethoscope or an instrument known as an “ultrasonic leak detector” may be used to detect the sound frequencies of leaks. Needless to say, the “ultrasonic leak detector” is a much better instrument to use in detecting leaks in odd and awkward places like conners and crevices.

The infusion process starts by turning on the resin suction. The flow is carefully controlled and monitored to ensure the resin is infused evenly into the cavities in the fabric before they started to set-in.

Once the resin is infused thoroughly in the fabric, the suction to the resin is shut-off. The structure is then waiting to be cured. During the solidification of the resin, an exothermic chemical reaction took place. By

monitoring the temperature on various parts of the structure, it can be ascertained that the resin in the structure is completely cured or not. An infrared thermometer may be used for the purpose. The temperature tells when the resin is beginning to cure and when the resin has completely cured. The release sheet can then be removed from the structure and the whole structure can be taken out of the mould. The infusion process has been completed.

Pros and Cons of Hand-lay and Infusion Processes

Multi-directional weaves (MWR) and char standard mat (CSM) are commonly used in the boat building industry. These fabrics are layered and oriented according to specific design requirements to create the strength needed for the construction of the structure.

In reality, the hand lay-up process is simple to execute. However, the quality of the product is hard to control. The quality depends to a great extent on the skills of the workers who carry out the work. The skills to laminate and reinforce the matrix. The mixing and application of resin are also crucial in maintaining the quality of the product. When this process is used, it is very difficult to maintain the correct and consistent ratio of fiber and resin throughout the structure. The strength of the composite will be weak if resin cannot be ensured to fully permeate the cavities in between fibers. Resin is generally applied generously to ensure the bonding of the fiber which leads to an unnecessarily high resin to fiber ratio. Products produced with such a resin ratio will be brittle and has a lower mechanical property as well.

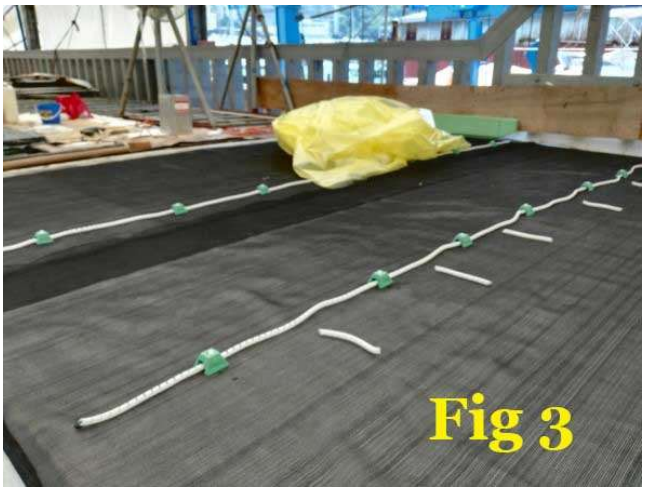
For carbon fiber fabrication, the traditional hand lay-up method is too primitive to ensure the advantages of carbon fiber when producing a product. However, the vacuum infusion process can eliminate the draw backs of the hand lay-up process. The fiber-to-resin ratio can be improved significantly resulting in a stronger and lighter product. The vacuum infusion process can ensure a consistent usage of resin. Less resin is required to ensure penetration of resin in the fabric thereby reduces wastage. This process is suitable for a wide range of part sizes. It will ensure products are built and reproduced consistently. The vacuum infusion is a clean process! There is no resin exposed to the air during its fabrication which results in a cleaner working environment than the hand lay-up process.

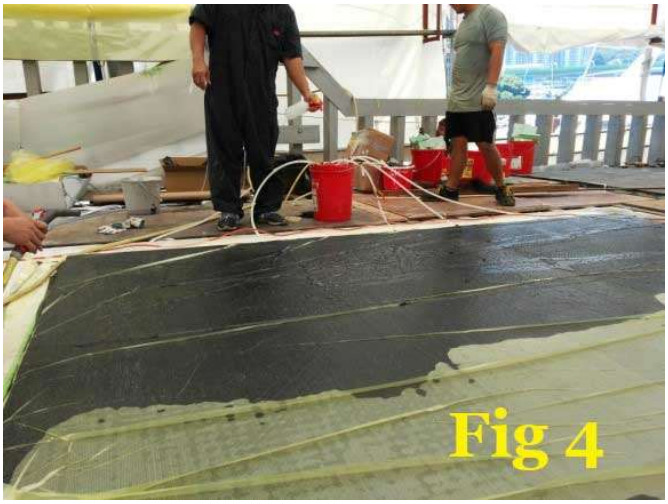
Hence, the vacuum infusion process has been chosen for the fabrication of the superstructure for the 43-meter mega yacht!

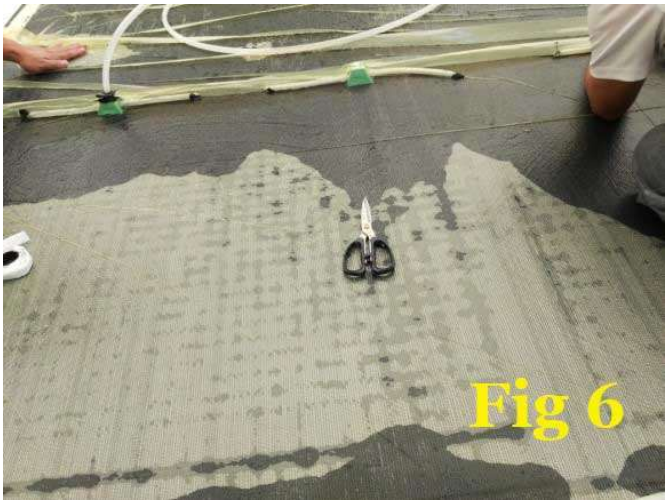
Building the Superstructure

The project to build the yacht started in the mid-2016. Teak was used for the construction of the hull. The deck covering (Fig.3, 4) and superstructure (Fig.5, 6) were made with carbon fiber composite. Instead of building a complete mould for the superstructure, simple mould or disposable tooling had been used to build the superstructure in sections! Wooden boards were placed on beams of the deck to serve as the base of the mould. The preparation procedures in preparing a mould for the vacuum infusion process were the same as described above. The fabrication was completed in sections to reduce the extra space needed for the

construction and to arrest the extent of damages during construction (if they occurred). On completion of the sections, they were joined together to form the superstructure!







The application of the vacuum infusion process in the fabrication of a carbon fiber structure has never been done Hong Kong. Knowledge on dynamic theory, viscosity of resin, characteristic of carbon fiber and a good understanding of the infusion process, infusion pipe arrangement and the formation of superstructure are required to ensure its success. There were many new challenges to overcome such as the temperature and humidity changes during different stages of construction, limitation of foundational facility and the fabrication of vertical members. All these challenges were resolved by adjusting the process steps and by building experimental pieces to test out solutions during the building process (Fig.7, 8). This project was eventually completed successfully with a saving of 16% of materials. It reduced not only the cost but also the weight of the ship.

The Future

Although carbon filer is relatively more expensive than other fibers such as glass fibers or plastic fibers, it offers exceptional advantages on strength, rigidity and weight reduction. The finish products of carbon fiber are sleek, chic and has a high tech and futuristic look. These advantages will attract aficionados to pay a bit more for building them.

(Written by W.S. Chen Simon)

HKJB & HKIMT Coming Activities

Date	Event
11 May 2021	Committee Meeting
May 2021	Technical Seminar on Decarbonization Regulations Update
June 2021	Technical Seminar Application of Sponge Blasting Technology in Hong Kong

HKIMT Council Office Bearers

Hon. President:	KOO David
Hon. Vice President:	Ir LAW M.H. Francis
Chairman:	CHEUNG Tai Kee
Vice Chairman:	LEE Yiu Kit, Leslie
Hon. Secretary:	Dr. FUNG Ka Shuen
Assistant Hon. Secretary:	CHEN W.S. Simon
Hon. Treasurer:	NG Ngai Wing, Jammy

HK JB Committee Office Bearers

Chairman:	CHEN Wai Sang, Simon
Vice Chairman:	Kaushik ROY
Hon. Secretary:	LEE Yiu Kit, Leslie
Assistant Hon. Secretary:	CHAN Lok Sang, Yoyo
Hon. Treasurer:	TANG Kwong Fai

Disclaimer

Download Websites

https://www.imarest.org/local-communities/asia-pacific/hong-kong-joint; and

http://www.hkimt.org.hk/publication.html.

Votes of Thanks

The Committee is extremely grateful to those organizations who place their advertisements in eMARINA in supporting its role for the interest of the maritime professionals. Details on advertisement fees are obtainable from the Hon Secretary.

Enquiry

Hon Secretary, Hong Kong Joint Branch of RINA and IMarEST, G.P.O. Box 2516, Central, Hong Kong